

TPM Volume-2

Total Preventive Maintenance

Muda in the Machinery of the Gemba and PM-KPIs

2019a Edition

Koichi Kimura



Factory Management Institute

COOPERATING TO REACH EXCELLENCE



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At time of publication and over the age of 75, he continues working on the dissemination of original Japanese methods and more knowledge even the one learned from the pioneers and, continues working as international consultant for the last 22 years in more than 11 countries, training clients, as a lecturer and writer. Even now, experimenting and researching innovative methods and growing in the field of Production Management and Corporate structuration.



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Notes: Going and Comeback to the main theme.



Third level of the Issue, in order to provide more clearness to the structure of the text.



Lower levels of the Issue, commonly 6th or 7th And, pointing out necessary explanations about pictures or graphs.

UPDATING TABLE:

Date, Version-Previous & V-Next	Chapter (I..XX...)	Chapter Point.- sub-point : (Updating)
December 2017, V-1.4 → V-1.5	VII. KPIs for Machinery Control	2.- Hourly Output Figure (Summation Symbol in Denominator)
December 2017, V-1.4 → V-1.5	Final WallPaper: Machinery Performance KPIs.	Final Wallpaper: From V-0 to V-1.1 (Unification of criteria with Chapter 3)
2017 V-1.5 → 2019a	Re-Edition to updated 2019 format	Each and every chapter

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I. Introduction

As you know my professional fields are TPS, TPM, TQM and Kaizen in Factory Management. And my working field is gemba.

And I teach and train the methods of "Creating profit internally".

Creating profit internally? ...There is no doubt and it is agreeable by anybody that a company is necessary to seek and increase profits to survive. And for seeking profit there are 2 ways. One is in sales expansion. Another one is to seek profit internally by mean of reduction of Muda.

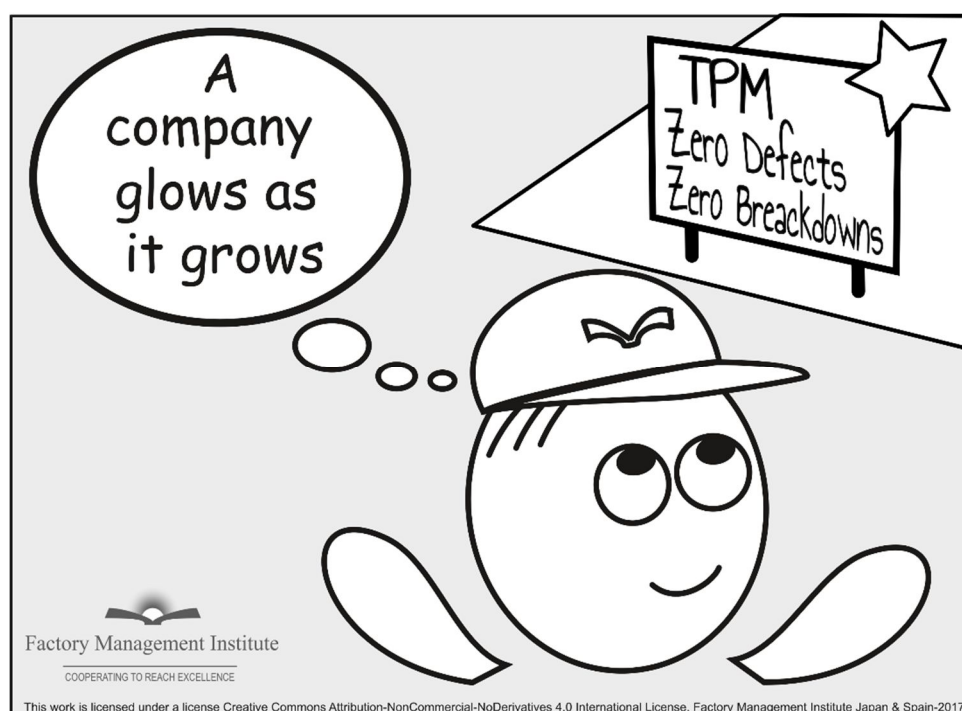
Therefore, my job as a consultant is to help the practice of seeking profit internally, thought out my expertise field in production gemba and office gemba.

1) In this column I also wrote about the Managers-Training.

I believe there is no doubt that the position of manager is important. Because he/she must be a reformer, leader and have the role of mediator between top management and gemba.

2 decades before (or more?) there was popular word which was "uncertainty century". But at present the surrounding circumstances are uncertainty, complexity, fluctuation (change) and unambiguity. Then the condition of Gemba (employees mind, sense of value) also is changing.

And in such trend, the manager's qualities (qualification) required is changing and is required to improve himself or herself more. He must be a good leader which is required deep understanding of his members, use of team strengthen, bringing up team capacity, promotion of teamwork, preparation of working environment, planning, coordination beyond departments, inspiring, coaching and just evaluation.



And, to deploy a Top-management decision in companywide, the role of middle management is quite essential. Such important person. Does manager receive appropriate education and training?

2) By the way, I have requirements of KAIZEN lecture.

And the attendances are most of the case manager and supervisor classes. And from when I had a doubt about managers qualification and education & training.

Because they haven't the experience to make kaizen by themselves. They have very high potentials as a manager and have learned the theory of management. However, they have no experience to take leadership for (for instance) kaizen. And it is quite clear that they cannot show proper leadership.

Do they have appropriate education and training about manager's job?

When introducing whether TPS or TPM, TQM, on some occasions, it is necessary to make the managers education & training. Of course, for adopting to the background which to be changing, managers training & education is essential.

As a manager's education & training, I use the technique of Jishu-ken.

II. OJT¹ + Committee activity

One company (I call M company) asked me to implement the change (reform) of the production and office gemba.

This company intended to establish the project of TPM introduction for the reform of Gemba.

It is good idea to introduce TPM for company reform and to reduce and eliminate Mudras which impede profits. Indeed, M company intended to seek profits internally.

When I met the president and directors, I confirmed their requirement and wishes. Their requirement was me to join and lead their TPM project.

Then I questioned their wish again. And why do they want to introduce TPM. Their wish was to recover and increase profit in eliminating Mudras.

And I accepted their request with one condition and additional activity. They asked me to join and make advice to their project. However, I don't like "project".

Why don't I like project activity almost, in this country?

I believe a project activity is good means for resolving managerial issue. But I don't recommend to take the project style activity in this country, because of High staff turnover. That means the staffs who participated the project, and after finishing a project and after getting an experience, they leave the company. And the consultant also leaves from the company and the gemba. Then as the result, the failure in incomplete cases to happen, because of the incomplete system transfer & penetration and/or the occurrence of new problems which weren't resolved by the project.

If you don't have such concern, please do project style improvement activity.

1) The way of work by Committee + OJT.

Rather than a project style I recommend to take the improvement style which is the combination of OJT (On the Job Training) and Committee activity.

And I put the importance in the development and streamlining current organization to be possible to continue the endless activity. Consequently, I spoke them that way...

—Your fundamental wish is to increase profit. However, Total Preventive Maintenance or even Total Productive Maintenance cannot always respond to your fundamental wish. Some case it is OK, but some case it is not...

In TPM introduction, I teach and practice the machinery management system. And in just TPM which is even Total Productive Maintenance, it is not possible always to reduce all cases of Muda. For the machinery related case, TPM can be useful.

¹ OJT: On the Job Training. https://en.wikipedia.org/wiki/On-the-job_training

Therefore, it is necessary to add additional activity for your wish. The additional activity is also necessary for the success of TPM.

Indeed, they revealed their surprise to my talk, because of their image of TPM was Total Productive Maintenance/Management which involves the machinery management method and some kind of system for indirect & administration improvement.

Moreover, they imagined that any cases of Muda can be resolved on the extension line of TPM in machinery improvement activity. Another words. Just Total Productive Maintenance or Total Productive Management has some system which can cover any case of Mudas which are 7 Mudas in production gemba and (for instance) defective design (design engineering) and long lead time of paperwork. And they claimed and said in quoting the TPM book: "Deploying TPM activity in Production Gemba and expanding it to companywide" ...Then, I told them...

—There is no such convenient tool which you imagined in TPM. Is it possible to resolve any case of Muda in TPM? —and I continued...

—Do you say joke? You told me that you have the problem in office work, didn't you? And one of problem is the quality of products design in design engineering department. It is one of serious and essential matter to improve the design quality, because the defective design causes the defect loss, Over Processing Muda and the Muda of unit material usage. Also the design engineering department has another problem which relates to the gemba Muda and is the Lead Time. You need to understand that the approach in Production Gemba and Office Gemba² are quite different.

—How many gemba employees do you have? Next to thousand or even more workers? Anyway, your company also the number of people in gemba is overwhelmingly many in comparing to office gemba. Therefore, the approach in production gemba is to start the establishment of the mind of "**All people's participation**".

And the Muda causes relate to **5Ms**: Man, Machine, Material plus Money and Method which are the essential factors of production.

On the other hand in office gemba, is there such case which the cause of the CAD, talking about hardware or software trouble, when a defective design is made and is flowed out to production gemba? There may be, but very much rare.

Material defect? Material of design department is the specification of customer. There are such case. But it is not the responsibility of engineering department. So the cause of defective design is just engineer's reliability: **Man** and **Method**.

Again, production Gemba is required to control all of 5Ms in overwhelmingly many peoples. And, on the other hand Office Gemba is required to control just Man (Skill) and Method (System) in small number of peoples (comparing to production gemba)

Related essential factors are so different in production gemba and office gemba. Additionally, most of the design work is not the team play like as production gemba.

² **NT. Production Gemba & Office Gemba:** Please remember that both belong to the GEMBA. The Office Gemba consists, basically, in the supporting departments to the Production Gemba such as: Human Resources, Administration, Design Engineering, Manufacturing Engineering, Logistics, Purchasing, etc.

Again, I say that the approach in production gemba and office gemba are different. And “Deploying TPM activity in production gemba and expanding it to companywide”. So, there is no expectation in above word.

They understood my word. However, they told me that I was agreed to introduce TPM for the Muda reduction activity. Then I told them that...

—Let’s introduce TPM (**Total Preventive Maintenance**) in production gemba. And let's use the word of TPM as companywide "**slogan and logo**". Then we started the TPM introduction.

And based on this experience and, many other companies’ experiences, I will describe each and every theme.

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III. TPM Introduction

Again, I was requested to lead the TPM introduction by M company. This company had started the study of TPM already and knew the Nakajima's 12step of TPM introduction.

When looking for the TPM introduction steps in Social Networks Services (SNS), there are many descriptions and 'Nakajima's 12 steps of TPM' is well known. These steps are quoted in the TPM book of JIPM also. So, Nakajima's 12 Steps in SNS is presented as follow.

1. Announce Top Management's Decision to Introduce TPM.
2. Launch Educational Campaign.
3. Create Organizations to Promote TPM.
4. Establish Basic TPM Policies and Goals.
5. Formulate a Master Plan for TPM Development.
6. Hold TPM Kick-off.
7. Improve Equipment Effectiveness.
8. Establish an Autonomous Maintenance Program for Operators.
9. Set-up a Scheduled Maintenance Program for the Maintenance Department.
10. Conduct Training to Improve Operation and Maintenance Skills.
11. Develop Initial Equipment Management Program.
12. Implement TPM Fully and Aim for Higher Goals.

The next page description is a little different to the Nakajima's original one. Then to be accurate, I present his material in faithful translation. The contents of his 12 steps are helpful for considering necessary action.

But firstly, I told him (M company) that I don't obey these steps and I implement more effective ways which are OJT and Committee activity.

Nakajima's 12 Steps		
Step of Introduction Preparation		
1	Declaration of TPM Introduction by Top	Declaration in Management Team Meeting and Board Meeting. Declaration in TPM internal course
2	TPM education and Champaign	Managers: Course and camp for individual class managers
		General employee: Declaration in employees' course in VTR.
		Declaration in leader's education and internal course
3	TPM promotion organization and staff organization model	Setting the committee, speciality subcommittee and secretariat Deployment of the staff organization model
4	Establish basic TPM policy and Goals	Management goal, Activity target, Clarification of activity policy BM setting and creation of kaizen theme in Loss investigation
5	TPM deployment master plan	3 years master plan, Yearly base, quarterly base action plan and Monthly base schedule
Step of Introduction		
6	TPM Kick-off	Re-declaration of the policy to customers and suppliers (Invitation for customers and suppliers)
Step of Introduction Implementation		
7	Establish system of Effective production department	Chasing the limit of effective production
7.1	Individual (Kobetsu) Kaizen	Project team activity and small group activity
7.2	Autonomous maintenance	Step method, Diagnose and certificate
7.3	Planned preventive maintenance	Betterment preventive maintenance, Regular preventive maintenance and preventive maintenance
7.4	Education and Training	Group education for leaders and Transmission to employees
8	Establish Development & Management system of Products & Equipment	Chasing easy-to-make products and easy-to-use equipment
9	Establish Quality maintenance system	Condition setting that not cause defect and maintenance
10	Establish System of effective administration and indirect departments	Production support, streamlining own department, streamlining equipment
11	Establish Control system of health & safety and environment	System of 0 accident & disaster and 0 pollution
Step of fixing		
12	Implement TPM fully and level up	Challenge higher goals than auditee of TPM award of excellence

1) Declaration & Policy

I never recommend to make the declaration and policy with goals in the middle of the period (financial period).

TPM introduction is very hard event as a company. Therefore, it must be planned in his long- or short-term strategy. And it must not be planned on the spur of the moment (lightly) whether the company has his strategy or hasn't. Because the Gembas might have the serious confusion and also the shortages or ineffectiveness of resources.

And the declaration must be made in (for instance) New Year's Policy Statement speech with deep consideration and preparation.

And if I join in the middle of the period, I start from other important and fundamental improvement such 5Ss, Committee activity (Kaizen and Safety) in production and office gemba.

And when coming the timing of New Year's Policy Statement preparation, I teach and train the corrective way in working with them.

Then at the New Year's Policy Statement, the president needs to make the declaration.

2) OJT of "8. Establish Development & Management system of Products and Equipment"

8	Establish Development & Management system of Products & Equipment	Chasing easy-to-make products and easy-to-use equipment
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The good timing to teach and install this system is at a timing of a new product introduction which is necessary to develop and consider the sales & marketing, new products design, production method, quality deployment, development of machinery & tools and investment, preparation of materials, production line preparation, skill training, production control, suppliers and, also, cost.

Of course, when the timing of a new production line, safety and environment are considered.

And I teach this system introduction in real case of new products and equipment introduction in the Initial Products Quality Control Committee which is constituted of the above relevant departments in the committee and subcommittees.



Flying notes by Sensei Kimura

Initial Products Quality Control - IPQC

When having a new product, the most unstable period is a new start of the production line.

The causes of unstable products in quality and production are the quality and production volume in skill level, new machines, new materials and poor experience.

And when having a new product, it is quite natural to have the poor quality and poor labour efficiency (unfortunately).

In fact, this start-up losses are quite big in the total product lifecycle.

For instance: My previous company produces wiring harnesses. And the lifecycle of the car model is normally 4 years. Therefore, if it takes 3, 4 months to stabilize in skill and quality, it is fatal.

Probably there is no difficult products such wiring harness of car manufacturing. However, to pursue the vertical start-up of new products is essential matter for any industrial company.

And it is quite important to establish this committee (IPQC) to reduce such new start-up difficulties. Therefore, I recommend to adopt this system in your case.

TPM is not theory, but practice. Then, when occurring new products introduction, I teach this in OJT. I will describe more detail of Initial Products Quality Control Committee in the TPM column.

In this company... I accepted and began my support at middle of April which corresponds in the middle of the financial term.

Consequently, I suggested him that let's make up the action plan in deep consideration and also make up the kaizen committee in suggestion scheme, gemba kaizen, 5Ss activity and safety up to new financial term.

And I told the company's directors the necessity of managers training.

I. The Managers Training

Kaizen and the kaizen mind in gemba are essential. Consequently, let's start the kaizen training of managers and supervisors & leaders right away. All managers, supervisors must attend this training course even accountancy, financial, human resources such administration departments.

Step 1: Start up and make action plan from June. It is taken 6 months.

Step 2: Start and make New Year's Policy Statement from Sep 1. It is taken 3 months.

The managers and supervisors should be the position of leader or, advisor of the committees.

Then, I started the managers training for Kaizen. And as usual, I made the presentation of gemba kaizen as the first day. And we made the groups which one group was composed of 5 members in the consideration of job diversity.

Then I gave one homework which should be done by my next visit (one week later). The homework which I gave them was...

—Any theme is acceptable. But at least one theme by a group must be implemented —I stressed and at second visit I expected the progress of 5 groups of managers and supervisors. However, my expectation was betrayed. No one of groups started the activity.

In fact, the managers and assistant managers had a complaining about the homework. And They told me...

—We expected to listen and learn the method of improving the kaizen mind of employees (which are office gemba staffs and production gemba workers). We know that for improving gemba and reducing the Mudas in each gemba, the kaizen mind is important. Therefore, we need to learn the methodology of improving kaizen mind...

1) Kaizen mind first? Or Kaizen practice first?

Then I made very short lecture to them...

Every one, please listen and understand what the effective step to kaizen condition is: 'Can mind draw the activity? Or... The activity can change the mind? '

You want the case of first one. And, it is correct in one condition which is to have a crisis as your company such bankruptcy. Then, in such circumstance, whole people can be united in one. There is one company which is Chrysler (One brand of Fiat Chrysler US). As you know this company experienced the bankruptcy. Then the line workers were dismissed. And after the subsidiary of Fiat, the workers were reemployed. And in the share of crisis the employee's mind was very much improved. And, as the results, I heard that the kaizen mind also was improved.

By the way, is your company in such bankruptcy crisis? Or... Do you wish to wait such situation to be occurred? I believe, of course, not.

I explained the very special case such bankruptcy. If you don't want such extreme situation, you need to have the way of hard effort in education and motivation.

And/or you can take better way. Please listen...

‘The mind doesn't change the act; the act can change the mind’

This meaning is: Improve mind is important. But if approaching from just this, you might take a long time to reach to the fruits. Rather than the expectation of kaizen mind in teaching, I recommend to implement kaizen activity to change and bring up kaizen mind. For kaizen implementation, any top decision or strategy is no necessary. Just do it.

There is the process of change as next.

1. Change mind then;
2. Change act then;
3. Change habit then;
4. Realise change (revolution).

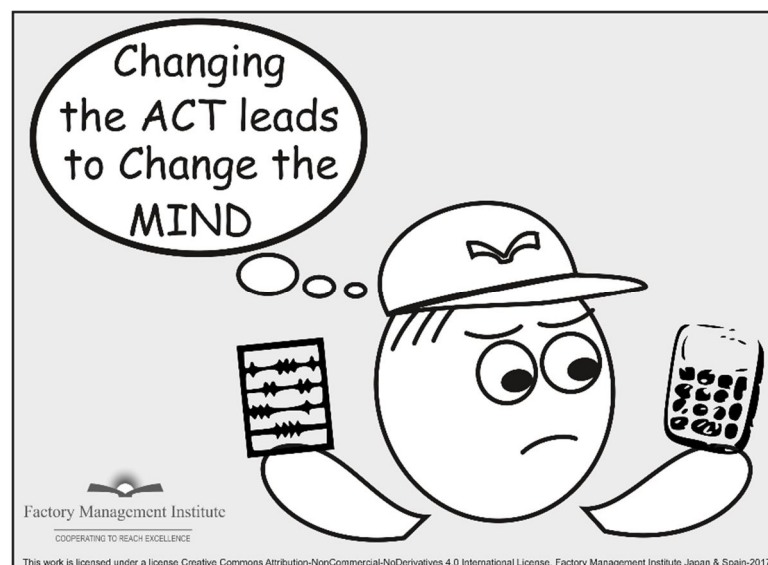
But my suggestion is a little different:

1. **Change act (anyway, take action) then;**
2. **Change mind then;**
3. **Change habit and;**
4. **Realize the change (revolution).**

I quite often am asked to make the lecture of kaizen. And I always tell them...

—You like to listen the thankful mantra, aren't you? But even you to listen thankful mantra thousand times, the fruits don't grow up. In fact, there are many fake consultants who lecture "what is kaizen and how" as their job. Indeed, I'm also fake and sometimes gain income with such thankful mantra lecture. Then, please change the order of "**Change mind first to Change act first**" —and I continue...

—You are managers, aren't you? And, who does teach kaizen to your people? Actually, Not me, but you. Unfortunately, you might not have the experience of kaizen, might you? ... Therefore, you need to have the experience and self-confidence to lead your people. And also, you need to show your "kaizen mind" to your people. So, I tell you that you do first.



Now, this is a training and practice:

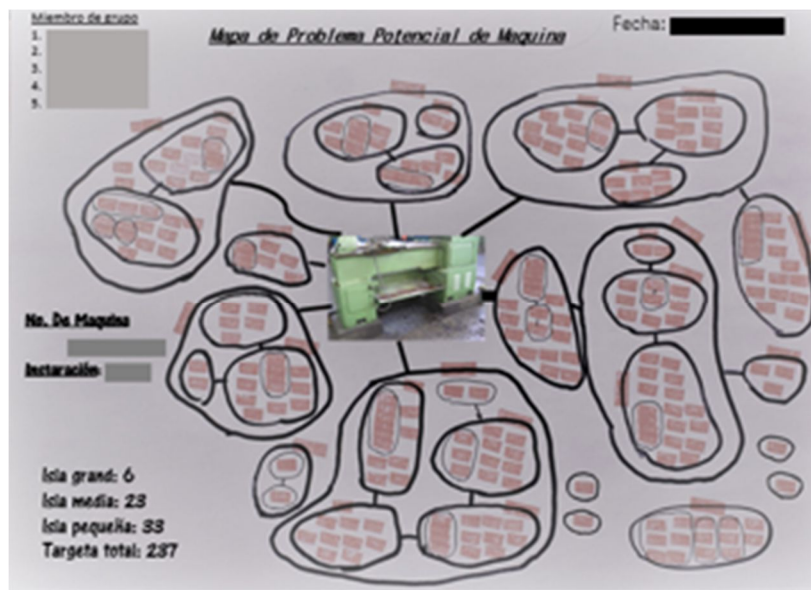
1. Find Muda, firstly.
 - a. Please go to the production gemba and each group separately stand by a machine and watch and investigate the machine work and the operator work.
 - b. Then write down the problems and cause of problem you feel in the cards. So the target of number of ideas is more than 300 cards by each group.
 - c. Use KJ method rules:
 - i. Duplicate ideas are acceptable
 - ii. Any idea not to be neglected
 - iii. No criticism to any idea
 - iv. One card in one idea
 - v. Short and concise writing
2. Resolve these by yourself, secondly.

Then, they started their act (practice) in front of each machine. And write down the machine problems and the problems of operator's movement in the cards.

Fortunately, or, I may say very unfortunately, there were many problems in the machinery area.

As you know this method was used by Taiichi Ohno who sometimes ordered his persons. And said "Don't move out from this circle (which is written with white chalk by him) and watch".

Then they made **Machine Potential Problems Map**:



Unfortunately it is not possible to show the real case of this company because of the confidentiality obligation, but just image.

The above photo is the case of other company's Potential Problem Map of a machine in the training of QC Process Diagram. This group listed up 33 small islands which corresponds to 33 quality potential concerns. And the same method I trained to this company's managers and supervisors.

The title was **Potential Muda in Machine**. And, I requested them to make cards more than 300 ideas (5 persons/group, 60 cards/person) of Muda cases and potential Muda (cause of Muda).

This training course was made in following condition:

1. Group activity to be required, to be once a week (4 times per month) and 3 months training.
2. Each groups to register the convenient date and schedule.
3. First day
 - a. Watch man-machine at least half day, in standing beside the machine.
 - b. The other half day have to be used for making up the Potential Mudar Map.
4. Making action plan to resolve Mudar and potential problems.
5. Take photos of "before and after" to use in the follow-up chart.
6. It is required to resolve by themselves as much as possible.

The image of follow up chart:

NO	SUGERENSI	FOTO	SOLUSI	RESPONSABLE	KURIR	FOTO SOLUSI	DITAMBAH
01				Team Project			
02				Team Project			
03				Team Project			
04				Team Project			
05				Team Project			
06				Team Project			
07				Team Project			
08				Team Project			
09				Team Project			
10				Team Project			

PROCESS DEVELOPMENT DIAGRAM						DATE: ____/____/____	
Members							
1							
2							
3							
4							
5							
6							
No.	Detailed Problem/Muda	Picture-Before	Solution	Reponsible	Forward	Picture-After	Comments

I use this method too, in Gemba QC-circle. And I required them to have same experience which the gembas also are required to implement.

By the way, When making this training for managers, the trouble occurred "as usual". As usual? Yes, it is as usual in foreign countries: There was a claim by the managers and their saying is that they are busy for the "manager's job". Therefore, it is not possible to spend the time for the group activity and particularly to stand beside the machines and also make-up the chart in a whole first day.

It is, as usual for me, in my consultancy job. Therefore, I suggested to make this first day training during Friday afternoon to Saturday (holiday work) before noon. However, they were very negative to the holiday working. Then I suggested to register the time schedule as each group; nevertheless all groups had the lack of the member when making the group activity.

They never deny the kaizen training course; nevertheless they say that we are busy and cannot attend sufficiently. At the middle of this training, I discussed the situation of class collapse with the directors and the president.

—Now I could understand the capacity of your managers who have very high potential —I continue talking to the Top Management— and, they have a problem consciousness and a sense of impending crisis against the current managerial situation. This point is a redeeming quality as your managers. But unfortunately they cannot exert it...

—They have 2 points of weakness as manager. The first one is that they have no capacity of time management of their own time. And the second one is that they don't understand the manager's job. I was taught that the manager who cannot manage his own time can manage nothing at the manager's training course in my previous company —I finally said.

—Can they manage their departments? —I asked the Top Management and he responded me and said...

—It is our surprise. Of course they are working well. And we have no doubt about their capacity. But it is also our surprise that they cannot do the time control... So busy?

—By the way —I told them—, you have decided to implement TPM to reduce Muda in gemba. It is quite good decision. When looking around Gembas (production and office gemba), we saw many Mudas and cause of Muda, didn't we? For instance in office: 5Ss condition, Working LT, Action plan & results, Target control & result, Out-put quality & timing, Meeting & results, ratio o Sales / Employee Head account, Ratio of office worker to direct worker, Lighting, Office supply, Equipment maintenance and Fixed cost trend —and I continued...

—Therefore you decided to reduce these Mudas and causes of Muda in TPM activity. TPM is the slogan & banner to reduce the Gembas Muda. And just Total Preventive Maintenance is not sufficient to reduce Muda in production & office gemba even though Total "Productive" Maintenance. It is necessary to implement another way in parallel...

Then I recommend to implement the method of capacity improvement in Committee activity which involves: 5Ss, KAIZEN and SAFETY in Gembas.

In KAIZEN committee, I plan the introduction of the suggestion scheme, group kaizen, gemba kaizen and QC circle.

For the improvement of Office Gemba, I use the system of committee activity which includes IPQC (Initial Products Quality Control), Office 5S, KAIZEN and SAFETY. and in Office Kaizen, I require to make QC Process Diagram which you call or imagine VSM (Value Stream Mapping) for individual main job flow.

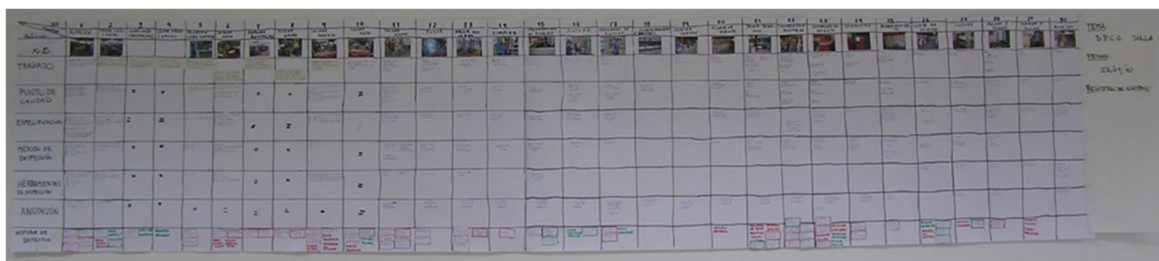
These activities are far from TPM. But we use TPM as slogan & banner. And, in order to develop these activities, we need to form the "mind-set" of leaders who are the managers, supervisors and line leaders.

My consultancy job is to establish the improvement capacity against the very long or continuous fight to Muda in the slogan of TPM.

—Are they busy? ... If they say being busy, you must reduce their job.

The image of QC Process Diagram

This is one group of students made this diagram in the case of chair production process.



And the form of QC Process Diagram is as next:

QUALITY CONTROL PROCESS DIAGRAM - QCPD						DATE: ____/____/____	
Members			PRODUCT:			<div style="border: 1px solid black; border-radius: 50%; padding: 10px; text-align: center;"> Actual Page <hr style="width: 50%; margin: 0;"/> Total Pages </div>	
1			DESIGN NO.				
2							
3							
4							
5			COMMENTS				
6							
NUMBER:		1	2	3	4	5	6
ISSUE:							
PROCESS PICTURE							
DETAILED WORK							
POINT OF QUALITY							
SPECIFICATION							
INSPECTION METHOD							
INSPECTION TOOL							
ANOTATION							

2) Are managers busy? What is the manager's job?

Still it was hard to start the managers and supervisors training. Therefore, I cannot reach to describe main topics. I questioned to the managers that, Are you busy?

And all of the managers told me that of course yes with one voice. Then I again questioned what the manager's job is? And they answered me their busy job contents. But I didn't make comments to their excuse or their reason of to be busy. And I taught the following stories.

What is the Manager's responsibility & job?

1. Maintain the current way in the standards. And;
 2. Improve the current way and standardize.
- Of course, including the teaching and follow up.

In Toyota, there was (and still is?) a slogan in the plants which said 4R: Make Rule, Teach Rule, **Keep Rule, (Follow Rule) and Change Rule**. This is the mind-set of standardization and also the step to improve Gemba.

- **Make Rule:** Improving gemba and standardize (make rule);
- **Teach Rule:** Teach the new standard to gemba people;
- **Keep Rule:** To let them keep the standard;
- **(Follow Rule):** Follow up the effect or whether to be correct or not;
- **Change Rule:** New challenge. Finding or devising better method and Make Rule or change the standard if to be incorrect or ineffective.

Even, another episode I taught them...

Honda Suzuka, which is one of plant of Honda in Japan and, when I was the design engineering manager, I quite often visited the plant to meet the engineering manager of the plant. One day when I visited the manager, he was in the canteen and doing the office work.

Then I wondered and asked why you do your office work in canteen? ... And he taught me that he (other managers also) had not his own working desk & chair. He has only the cabinet in his department. And when it is necessary to do the office work as a manager, he uses the canteen or the meeting room.

He said me that basically there is not so many paper work as a manager. Of course, there are such secret matter or the assessment of subordinates rating as a manager. Of course, it is necessary to check the data in computer. However, these are not so much.

Most of the job is in Gembas. And he makes the Gemba-Walk in office gemba and production gemba. And, for instance in office gemba, he sat down beside subordinate and makes conversation and follow-up, making question and seek the points of necessary support.

One of his important job as a manager is to let his subordinates succeed their challenges and routine jobs.

When I was young and was a manager, there was a taboo phrase which was "I'm busy". When I expressed this word, the division manager, who was my boss, told me in order to "reduce job". The meaning of this sentence is "disqualification" as a manager.

Well, backing to the managers training course of M company... Then, I ignored these managers voice: "being busy".

Anyway, this company's managers also were required to have the corrective manager's mind-set. And, about the Manager's Role, I describe a little more in next issue.

Then, I told them...

—As you recognized there are many Mudass in Gembas, aren't there? ... So, the meaning of many Mudass is that there is something wrong. Whose job to identify the something wrong is? And whose job to improve? ...Me? ... As a consultant? ...I say NO.

—This is your job as the managers. And you should participate and take the position of leading this TPM activity. Managers and supervisors. Please decide whether you continue this activity or not. Of course, yes, aren't you?

—Now, can you lead the TPM activity and committee in no experience?

Eventually, the Director declared the implementation of TPM activity which we had confirmed in other conference. And at last, we could start the first step which is the managers and supervisors training course, but again, another claim had occurred...

3) The 3rd visit.

Next week, after the plant tour we came back to the conference room.

And I required them to re-start the activity. However, again one claim was expressed by the accounting manager.

—Sir. I'm an accounting manager and haven't any knowledge of machines. Also, my gemba is accounting office. Therefore, it is no meaning to participate and not possible to contribute to this group (which was constituted of quality, process and design engineering manager, supervisor and this accounting manager) —he said.

And same voices were made by human resources and other administration department managers.

Then I explained my way that when establishing a kaizen group or project, I willingly make it in job type diversity. In my experience, I knew that the group of job type diversity can gain better result than the group of similar job. Therefore, I required to continue in same members which we decided in the first.

But still the accounting manager insisted his thought and said.

—It is no meaning for us because there is no relation to my accounting department job.

The human resources manager also nodded his assent. At this point, I told them.

—Firstly, please understand the step and method of kaizen deployment in this course. This method of kaizen deployment is same to your gemba —and I continued...

—Secondly you told me there is no relation between the accounting and production gemba, didn't you? For instance, what is accounting job? ...

—I believe the accounting job is to state the "results" of gemba in figures in KPI (Key Performance Index). Also, you have another one of essential job which is to give the timely data to the gemba to achieve or keep and realize the target profit.



Flying notes by Sensei Kimura

By the way, **Job type diversity**, this is one of my essential style when establishing group activity.

Recently, in 2016, the Boston Consulting Group (BCG) and The Munich Industrial University of Germany presented very interesting joint report. This joint investigation and reporting was made across 171 companies of Germany, Switzerland and Austria about the identification of the relation about Innovation and Diversity.

The contents of the report proofed my way to be correct in the figures. In order to the diversity of "Industry background, Country of origin, Career path and Gender" is effective for innovation. Conversely the diversity of Academic background has no relation to innovativeness, and the diversity of age is reverse to innovativeness.

The right or correctness of this joint report can be seen in the success of USA. For instance Google was made by an American and a Russian graduate students (postgraduate) and most of the venture companies was established by the combination of Americans and overseas students. The diversity is one of strong point of USA.

—No relation? —I questioned myself and the group—. Of course, there is it. I don't expect the mechanical engineering knowledge to the accounting manager, but expect the awareness from the point of view of different job.

—Finally, I expect the job type diversity which to mix the different kinds job experience in making group based on my experience.

This company... Of course, it is not possible to require diversity of Industry background, Country of origin, Career path in one company. However, it is necessary to seek similar effectiveness in the organization as much as possible.

4) The group of accounting.

At last, all groups started their group activity which were mixed the style of Jishu-ken and QC Circle. And the first half day machine watching and the half day making-up chart are the style of Jishu-ken. The activity to be continued was the style of QC Circle.

Furthermore, there was an interesting conversation in the group of Accounting Manager:

—This machine is so dirty, what is this? And why? —said the Accounting Manager

—Machine is dirty as usual when working, because of using many lubricants. It is quite natural — answers the Gemba Supervisor.

—The lubricants overflow from the machine and on the floor. Then it is necessary to make the sawdust barricade to prevent the lubricants on the floor, isn't it? But why it is necessary to use so much lubricant as to be overflow from machine? Machine also so dirty —said the Accounting Manager.

—Lubricant is necessary for the functions of Lubrication, Cooling the work piece and removing shavings. —echoed the Engineering Manager

—I understand the necessity. But how much is the corrective usage of it? —said the Accounting Manager.

I think it is good point. We don't know the adequate quantity. Also the problems of oil and lubricant usage is one of difficult point for 5Ss... Shall we look around the situation of other machines? —the Gemba Supervisor said.

—But Sensei told us not to move out from this machine —replied the Accounting Manager.

—No —said the Engineering Manager and with mischief, he commented—, but just we go to the toilet and short brake. While they looked around the situation of lubricant usage in other machines.

—We have understood the situation of lubricants usage —commented the Engineering Manager —. Firstly, there is a variation of use quantity some ones there is an overflow in floor or not. Secondly, there is a variation of nozzles. And finally, there is the case of the spread in wrong point in one machine. Anyway, it is necessary to standardize the lubricant issue.

—Then let us resolve this issue, because the lubricant is not cheap, but expensive —answered the Accounting Manager.

This group made up his Machine Potential Problems Map with 320 KJ cards which has 49 islands which are the potential problems or causes of Muda. Also, they made the follow up chart with photos.

Of course, the suggestion of the accounting manager also was recorded in the follow up chart.

The method of Potential Map and follow up chart will be detailed in this TPM series. Digress from the managers training course.

Is it difficult to find Muda? ...And is it difficult to KAIZEN (resolve MUDA)?

II. What is Gemba Walk?

By the way, is it difficult to find Muda in the shop floor or in your Gemba? In order to explain better there was a conversation with an Operation Director of a company, not the above M company, but different.

—Sensei, we recently encourage to make Gemba Walk by managers in the last 11 months. And it seems to be good influence in the Gembas —commented me the Operation Director.

—I sees. It is good. And is there remarkable change happened? —I replied.

—I believe better communication with workers is promoted —answered Operation Director.

—I sees. It is good. And? Is there any remarkable change happened in 11 months? About quality, labour performance or, scrap reduction? Or, even, about the number of kaizen suggestions? Or, perhaps, about the KPIs of Safety, 5Ss? Or about the mind of "All people's participation"? —I questioned him.

—No Sensei. Still there is no remarkable change. We need more effort. And I think one of reason is the high labour turnover.

—I sees. But Mr. Director, you already continued almost one year of the Gemba Walk activity by managers.

Then it might not be able to expect any change even if you would continue it. Of course, it is recommendable to make Gemba Walk by managers. But there is something wrong or misunderstanding about the Gemba Walk.

—Something wrong? I believed Gemba walk is good thing. What was wrong? —questioned Dr.

—Of course, it is good and no doubt. But unfortunately, the managers misunderstand their duty and the Gemba Walk.

—Misunderstanding their job role? I do not think so and they work well as managers —replied the Operation Director.

—You told me that no remarkable change, didn't you? You company also intends to introduce TPS (Toyota Production System) as one of means of Lean Management. Then I recommended to introduce TPM (Total Preventive Maintenance), TQM (Total Quality Management) and Basic Factory management which are essential condition for TPS. And you told me the current activity of Gemba Walk by managers.

—Do my managers misunderstand their job role? —he interrupted my speech and told me.

—Ha, Ha, Ha. Yes, I have said that they misunderstand the job role. Listen Mr. Dr.

The manager's job role is **4R** (Make Rule, Teach Rule, Keep Rule and Change Rule) which show the meanings of Maintaining current standard, Changing current standard in development. Then Teaching and Maintaining. Keeping this cycle is their job role —and I continued...



—Mr. Director, is it difficult to find the Mudas or course of Muda in the factory? ...Finding Mudas or finding the potential causes of Muda is so difficult? Company spent 11 months, but there is no remarkable changes! This Gemba Walk itself is Muda, isn't it?

—So Sensei, do you recommend to stop this activity? —some confused he replied.

—No sir. I never say to stop it, but I recommend to let them consider the purpose of Gemba Walk and their job role. For 11 months you make Gemba Walk. But looking at this information board, there is an information which has been highlighting in the board since 2004 (recorded issue date). It is now 2007. Please, look at this information paper. This paper hasn't even the issue date —I pointed out.

—And the information paper discoloured to brown and hanged. Look at that window. Still the glass is left to break. Don't they feel such situation to be the irregularities, do they? In such situation is it possible to bring-up the kaizen mind, quality mind and safety mind moreover the mind of "All People's Participation" in employees?

—OKY, Mr. Director, please stand and look at that area. It seems to be a stock yard. And how many points can they (the managers) recognize the bad conditions and irregularities?

(This photo is not the above company, but just image. Because of the confidentiality obligation. Based on this photo, I continue to reproduce the conversation with the director).

—Mr. Director, once again in that area, how many points of irregularities are there? The irregularities are the causes of Mudas³.

³ Please check the answers in my 5Ss document:

—Hum... —he muttered seeking out into the picture—. For instance, that metal roll. It is put on the floor directory. Therefore, the first roll cannot be used as material and might be scrapped.

—Even in that small area there are many Mudas. Moreover, I don't like the word of Gemba Walk itself. Because the word Gemba Walk let associate the manager's job to be in office. A Gemba is the source of profit (production Gemba) or source of data (for management) —I continued...

—Therefore, managers must be in Gemba as first. The office work is also important but is as second...



Flying notes by Sensei Kimura

Meeting rule of SUMITOMO

In my previous company there is a meeting rule which is called 5 minutes rule. And at the timing of start of meeting, the door is rocked up. And no one can come in to the meeting if arrived late even director or manager.

The Meeting's Basic Rules:

1. Getting together before 5 minutes to start.
2. Meeting to be scheduled before more than one week, excluding urgent matter.
3. Meeting material have to be distributed before more than one day.
4. The theme is being well recognized and shared.

—By the way, is it difficult to identify Muda or causes of Muda? No, it is not difficult, particularly in your Gemba, because the factory is a nest of Muda —Then Mr. Director showed a displeasing face.

—I understood Sensei. But the managers also have the office job such paperwork, meetings etc. Therefore, they cannot be in Gemba always.

—Ah... Meeting... After the meeting with the president, we made a meeting with managers, didn't we? At that timing several managers were late. The latest manager came in the conference room 7 minutes late.

—Mr. Director, In Japan there is a very popular and well-known slogan which is **ICHI-NICHI ICHI-ZEN**:

ICHI-NICHI means One-Day, and;

ZEN means Good deed, so;

ICHI-NICHI ICHI-ZEN means *"Doing a good deed each day"*.

—In your authority... Is it possible to order the meeting rule company widely as your ICHI-NICHI ICHI-ZEN?

—It is good —also nodded the director—. I will make such meeting rule right away. But your saying of ICHI-NICHI ICHI-Zen is to let them (managers) implement kaizen per day & person, isn't it? ...Can they do it? —questioned me eventually.

—Is it to find Muda difficult? ...Or is it difficult to implement kaizen? ...Which one? Fortunately (Unfortunately) your factory is a nest of Muda. Therefore, to identify Mudas and the causes of Mudas are not difficult, I believe. But Kaizen. There are easy kaizen and difficult kaizen. For example, above photo, Metal roll is put on the floor directly. And it is the cause of Muda, as you said.

This case is not difficult and is easy in 4R implementation by manager. However, the case of defect in the photo is quality control matter related with TQM and TPM and is not so easy —And I continued...

—And Mr. Director, your job role is to order managers making 'ICHI-NICHI ICHI-ZEN' —I continued...

—So, Managers can do it and/or can let the supervisors implement it. Then 3 months later you tell them... 'Till when do you do only easy kaizen as a manager? Such easy kaizen is the matter of supervisor or line workers. And, you are managers ...Why don't you challenge to fundamental problem such metal cut quality improvement or prevention of overproduction?'

Again, is it difficult to find Muda? ...And is it difficult to kaizen (resolve Muda)? ...And, what is Gemba Walk?

1) Finding Mudas.

It is necessary to find irregularities (abnormalities) in Gemba. Is it so difficult?

Note) the definition of irregularity or abnormality. I use the word of "irregularity in Gemba". In a dictionary Irregularity is explained as next.

'A behaviour that breaches the rule or etiquette or custom or morality'.

And I define IRREGULARITY as next:

'Irregularity is: Out of the situation, what it should be'.

And the situation what it should be is **'The Standards and the Rules'**. And the **'out of standard'** or rule causes Mudas. And the situation what it should be should be improved always. For instance, 5Ss. I presented the 5Ss basic checklist and also 5Ss for high level factory. Then it is required to improve the checking points depend on the factory improvement. If a factory feel satisfaction in high score in the basic checking contents, it is ridiculous⁴.

Irregularities (abnormalities) are the cause of Mudas. In order to find irregularities, it is necessary to provide some tools, which are:

1. **5Ss & 4R checklists,**
2. **(Working) Standards & Visual aid and rules,**
3. **Visual control checklist,**
4. **Gemba KPI control graphs/Charts.**

There is another important tool which is 'Sensitivity of having doubt' as the next examples:

- Why does this operator pick-up workpiece and re-grasp in right hand?

⁴ **Score of 5S checklists:** Master Kimura teaches that 'perfection does not exist'. Therefore, the uselessness of complacency in scoring (him/herself) with a maximum level, in a checklist, is a ridiculous situation. For this reason, the score proposed by Master Kimura is a scale ranging from 0 to 4. Although the actual scale to be considered, in the global score and in the calculation of the mean, is from 0 to 5. That is, the maximum theoretical score, in the best case, will be 80% compliance. For example, 80 points (80 = 4x20) of every 100 possible points (100 = 5x20), in a checklist of 20 questions, with a real scale of 0..5 and, the maximum score of 4. *'Always there is a window to improve'* by Koichi Kimura.

- Why is this lighting position so high?
- Why are there some screw on the floor?
- Why is this vinyl tape used in this point and how is the standard?
- Why, why and why?

I have written the word of "Human Inertia". A human being don't feel the doubt to an accustomed conduct.

And Muda reduction activity requires the sensitivity of having doubt to even accustomed conducts even these are in standard.

For example, the case of Jishu-ken of the M company:

The team in which the accounting manager belonged targeted the reduction and standardization of lubricant.

The supervisor who accustomed the situation of overflowing lubricant couldn't have the doubt. But the accounting manager felt it to be strange. Therefore the group member diversity is better.

So, how can we bring-up manager's sensitivity of having doubt? ...One of good means is Gemba Walk "with letting them having purpose consciousness".

I don't like the word of Gemba Walk, however, it might be necessary in Europa & US, because the customs are so different to Japan.

But when making Gemba Walk, it is necessary to let them having purpose consciousness. And in the purpose consciousness, communication with Gemba people regarding working method, irregularities in 5Ss, Safety, Standards and Gemba KPI control graphs/charts (safety index & number of accident and contents, absenteeism, labour turnover, customer's concern, defect, labour efficiency, machine performance, material loss & scrap, inventory turnover, production & achievement & forecast, number of kaizen suggestions, progress of QC Circles ect.) should be included.

In Gemba, these KPIs graphs and standards must be used as the tools of communication.

By the way, when I visit foreign companies and see their process control charts and/or KPIs control charts, most of the cases the control charts (graphs) miss the **target line**.

In Japan the charts (graphs) which haven't the target line are never allowed. And the manager yell at the supervisor "What is your target!? ...Do you intend to improve!? ...If you have your intention, why don't you promise and mention in your control chart? ...Can I understand that you have no improvement target and even ideas and plan?" .And, the charts should be used as the tools of making conversation with Gemba people.

To bring-up sensibility of having doubt, the Taiichi Ohno's method is one of means. Writing circle with white chalk on a gemba floor, ordering to manager to not move out one hour and finding Muda causes.

I believe it is good training, if your company arrows this method.

2) Is it difficult to kaizen?

I'm required the conference of Kaizen by foreign companies. They wish to listen how to implement, how to motivate their people. They know the meaning of kaizen well. But they wish to listen how and how. Then, I tell them DIY or Do-It-Yourself. This DIY-word is popular in Europe and of course in US. And, I tell them that you are responsible persons of Gemba, aren't you? ...Therefore, DIY or Do-It-Yourself.

Even if listening my thankful mantra, it is almost no meaning. So, **Do-It-Yourself**.

In the basic condition which you can recognise Mudas and causes of Mudas, I would list-up your necessary activity.

1. DIY: In order to show your mind-set to your people.
2. ICHI-NICHI ICHI-ZEN: Doing a good deed each day
3. Progress visibility with the chart. Giving the sense of accomplishment.
4. Provide opportunity of Gemba people's participation to KAIZEN throughout the Committee, 5Ss QC circle, suggestion scheme and prize & opportunity of presentation.
5. KPIs: Provide control indexes in managerial KPI to control.
6. JISU-KEN or QC-Circle of managers and supervisors: In order to resolve more difficult matters.

I teach above process to stabilize the KAIZEN mind in Gemba and, in parallel, managers effort is necessary: Consideration and planning of such events and organization and, Motivation in Gemba by Gemba Walk.

Again, there is no meaning to "just listen the mantra".

3) Gemba Kaizen Investment

Also, I see the cases of misunderstanding about the investment for Gemba kaizen in foreign companies. Their misunderstanding is that the fruits of kaizen are not necessary any budget.

Kaizen activity requires some cost, but never expensive investment. For example: Seiso activity in 5Ss required the 5 to 10 minutes stopping the line; Suggestion scheme needs to provide the prize money; QC Circle requires the members out of line; and it is essential idea to provide yearly base regular Kaizen Campaign with banners, Logo & Poster competition and prize.

My previous company also (also country wide) has the campaign month (October). And I made such campaign in the foreign companies (in UK, Mexico, India and Vietnam) which were one kind of festival involving the families of the employees.

And, in the events, there were the presentation & prizes of excellent KAIZENS & SUGGESTIONS, PRIZE OF EXCELLENT QC Circle Groups, LOGO competition, and WALL-PAPER (poster) competition. Actually, the event began from 2 months before:

1. **1st month:**
 - a. To establish the kaizen campaign committee.
 - b. And start of preparation including the notice of festival and above events.
2. **2nd month:**

- a. Preparation of festival. Application of logo, poster.
- 3. **3rd month (campaign month):**
 - a. The closing day of campaign log, poster.
 - b. Preparation of banner, selection of excellent kaizen & suggestion & QC circle groups.
 - c. Preparation of president speech.
 - d. And the end of month (Saturday) the campaign event day.

Is KAIZEN ACTIVITY no cost? ...No, it is wrong and, KAIZEN ACTIVITY requires the cost.

III. Where is my Gemba?

I was an Engineering manager which involved Design engineering and Production engineering in my previous company.

At that time my Gemba was designing engineering & production engineering department floor, production Gemba and other manager's desk (to discuss or exchange information).

A small white board is equipped beside of manager's desk. And manager is obligated to show his/her whereabouts. This obligation is not just managers, but all staffs.

I remember that most of hours I wasn't in my desk, but was in Gemba. Then when moving to next Gemba, I needed to make a phone to a staff to inform where I am. And the staff re-write my whereabouts in the white board.

Of course, manager class hasn't his office like as Europa, US. In SUMITOMO, director class can have his office (room). But director class has his desk in his responsible Gemba. And normally he is in the Gemba desk. My next desk in my department was engineering director.

Recently I see the word of Gemba Walk in a SNS. However, there is no word which equivalent to Gemba Walk in Japan.

Going back to the case of M company's Jishu-ken (Actually that was a manager's QC Circle). This Jishu-ken was constructed of 5 groups. And the qualification of attending to Jishu-ken is the classes of manager, sub-manager (candidate of next-manager) and supervisor. At that time, 5 groups with 25 persons were selected.

One group which I introduced was the Accounting Manager involved.

I would introduce another one group. This group diagnosed the movement of machine and the operators. The product of this machine seemed to be still in the trial run. But it was wrong and this line was required in the normal run (mass production structure). However, they found that operator called engineer to discuss to resolve a problem quite often.

After the discussion, the machine began the production. But soon it was stopped by the operator. I was standing by this group and watching the machine condition with them. This happening also was recorded in my diary (activity report).

Now I present the conversation in reproduction of the scene between the Gemba Supervisor, the Sales Manager and the Engineer.

—The production is not normal. What is happening? —asked the Sales Manager.

—It is a new products production. But now it must be in normal run. I think that the machine condition is still unstable —said the Gemba Supervisor and spoking to the engineer— Mr. Engineer, is it still unstable?

—Um... Still we cannot get the precision of the corner of this new product —answered the Engineer.

...Omission... In the middle of Jishu-ken, the managers of Sales, Production planning, Engineering, Production and HR got together and discussed the temporary countermeasures. In fact the delivery

date for this new products approached just around the corner. After this urgent Gemba meeting, the sales manager complained and said

—Why do we have same trouble every time when having new products? —Asked the Gemba Supervisor.

There was a controversy in the managers. But omit describing it.

After the half day watch and investigation and in the grand meeting which got together all 5 groups. Another 4 groups were in the condition of to be able to start to make the Machine Potential Problem Map. But this group came to me and, the Gemba Supervisor told.

—Sensei, our group cannot make the Potential Problem Map, because we got very serious problem as you know. Therefore, we couldn't investigate this machine.

—Moreover, that machine moved less than 1 hour. It is not normal situation —replied the Human Resources Manager.

—OKY. And? —I asked.

—And... How can we do? —asked me the HR Manager.

—I don't know. You decide. You are managers, aren't you? How do you break through such repeated problems? What information did you get? Please write down your ideas for this problem solving.

This group discussed and found the solution of new products introduction. And I introduce the activity of this group in the Initial Products Quality Control (IPQC).

By the way I introduced the necessary KPI (Key Performance Index) of machinery performance control shortly in the TPM-1.

IV. KPI for machinery control

Now in here I would introduce the KPI for machinery control.

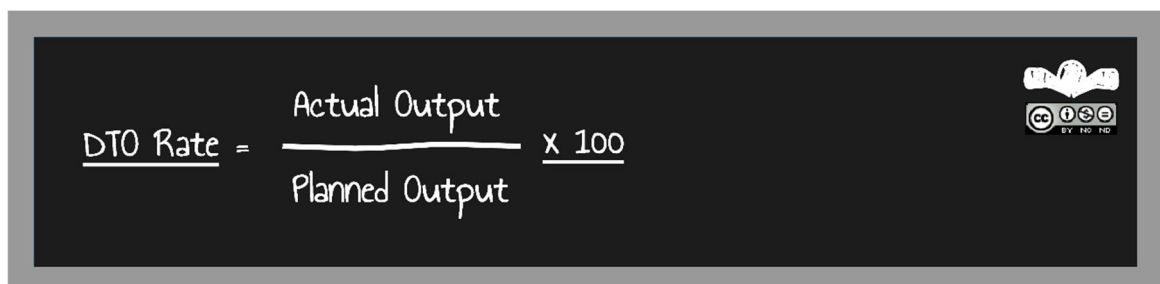
Actually, there are many ideas of indexes regarding machine performance and control. And there are so complicated indexes. But some KPI is necessary to machinery control.

Then I introduce the indexes of my previous company SWS (Sumitomo Wiring Systems) for your reference:

1. Delivery Time Observance Rate. DTO rate = (Actual Output ÷ Planned Output) x 100;
2. Hourly Output = \sum Actual Output ÷ Machine working Hour;
3. Machine Performance Rate = \sum Operative Hours ÷ 20days x 8hours x 2shifts;
4. Machine Working Rate = \sum Operative Hours ÷ \sum Planned Hours;
5. Machine Performance with Speed Rate = \sum Number x T/E: Speed ÷ \sum Planned Hours;
6. Breakdown Rate = \sum Machine stop Hours in Breakdown ÷ \sum Planned Hours;
7. Machine stop frequency Index = \sum No. of Machine stop frequency ÷ \sum Planned Hours;
8. Changeover Time = \sum Changeover Time ÷ \sum Number of Changeover.

For controlling machinery, it is necessary to have these KPIs. Now, I explain one by one.

1) Delivery Time Observance Rate (DTO Rate):




$$\text{DTO Rate} = \frac{\text{Actual Output}}{\text{Planned Output}} \times 100$$

DTO Rate must never be (for example) 110% or 90%, but must be 100%. The situation of 110% shows the overproduction. And the situation of 90% shows delay against the pull.

As you understand even if other rate or index are good, if the DTO rate is bad, it is the meaning of no observance to the pull of next process or customer. And to keep the condition of 100% of DTO rate, machinery control and TPM are required.

2) Hourly Output:

$$\text{Machinery Actual Output / Hour} = \frac{\sum \text{Actual Output}}{\text{Machine Working Hour}}$$


When making Machine Capacity Planning in Production Planning monthly bases, this index is used. For instance: Production planning for next month and after the material, and parts necessary quantity (bill of material) deployment, it is necessary to confirm the necessary machinery capacity against current capacity.

- In the bill of material, a part is required 1,000.
- To produce it, M machine is used.
- This factory has 2 M machines.
- The capacity of M machine is 2pieces/Hour.
- The planned Machine working hour is 8 hours/day x 20 days/month.
- Therefore, the actual capacity is:
 - 2 machines x 2pieces/h x 8hours/day x 20days/month = 640pieces/month.
- Actual capacity 640 against required capacity 1000.
- Then 360pieces capacity shortages against the requirement.
- It is more than the capacity of one machine. How did this company do?
- The capacity shortages are 360pieces which equivalent to 360pieces ÷ 2pieces/h = 180hours.
 - 1st Countermeasure
 - 2hours overtime which is equivalent t
 - 2h x 2machines x 20days = 80machine hours.
 - Still 100hours shortages.
 - 2nd Countermeasure
 - 4days holiday work (Saturday)
 - 4days holiday work x 1machinesx 8h = 32machine hours.
 - But still 48machine hour shortages.
 - 3rd Countermeasure
 - Use a subcontract for making up the shortages.

By the way, if the required production capacity is still over the actual capacity, the sales itself is limited, because of the trust of sales contract.

Using a subcontract is expensive in not only the special price for the temporally order, but also for the necessity of special quality assurance when receiving.

After responding to the customer's special and temporally order, the sales department negotiated to the customer to gain continuous demand and succeeded. Then, after the investigation of future prospect of this product, this company decided to invest and buy one new M machine.

Again, the index of Output/Hour is the result of machinery improvement activity with next KPIs.


And a factory needs to make better this index and increase machinery capacity. But, it is never the meaning of to use the full capacity at any time.

The true capacity is to be able to exert it at any time for a pull of next process or customer's pull.

3) Machine Performance Rate:

This rate shows the capacity of the machine on the time axis. And it is the rate of actual machine working hour against the logical and full working hour (logical full-time capacity).


And Machine working hour in this rate is Hours from the machine start switch on to the switch off. (Switch on the main motor and including idling.)

$$\text{Machine Performance Rate} = \frac{\sum \text{Operative Hours}}{20 \text{ days} \times 8 \text{ hour} \times 2 \text{ shifts}}$$


4) Machine Working Rate:

Changed from Machine Performance, because of both have the same names. In TPM-1, I wrote Machine Performance Rate.

This rate shows the ratio of Value adding hours against machine working hours. And it is calculated Working (or Operative) hour against the Planned Hour.

$$\text{Machine Working Rate} = \frac{\sum \text{Operative Hours}}{\sum \text{Planned Hours}}$$


Operative Hour:

Operative hour is the hour of just giving the value to the material or work.

Just giving the value to material? ...For example, Automatic cutting & crimping machine. So, take data from the press motor.

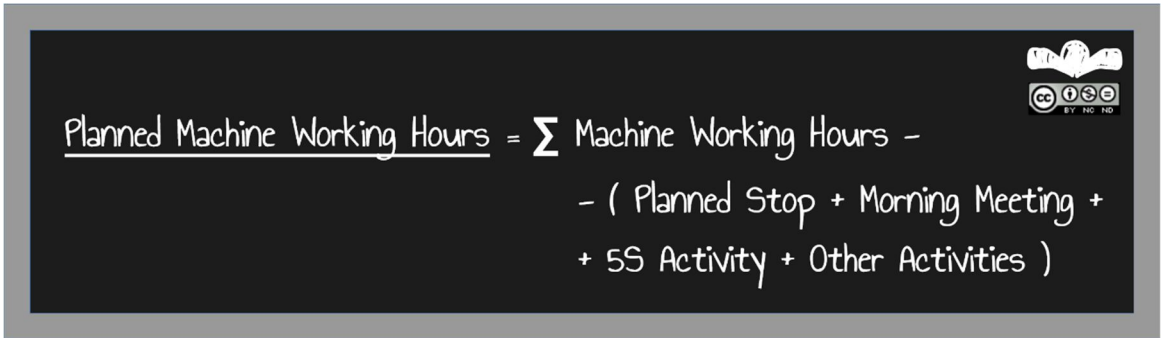
In my previous company which produce wiring harnesses of car manufacturing, we use lot of automatic machines which has the function of cable measuring and cutting and terminal crimping in both sides of cable cut.

This machine has a start switch (main motor start to run), cutting motor and crimping motor. And, even if the machine switches on, still the condition is not in cutting & crimping. It means that still not to give the value to the material. Therefore, it was decided to have the working hours in the cutting motor or crimping press motor.

Machine Performance Rate uses the time of machine switch on. If the main motor is used to take information, the hour could include the idle running.

Therefore, the Operative-Hour is the Machine-Working-hour. But it is the time of just giving the value to the material or work.

Planned Hour:


$$\begin{aligned} \text{Planned Machine Working Hours} = & \sum \text{Machine Working Hours} - \\ & - (\text{Planned Stop} + \text{Morning Meeting} + \\ & + \text{5S Activity} + \text{Other Activities}) \end{aligned}$$

5) Machine Performance with Speed Rate (MPwS Rate):

This rate shows the potential capacity in considering the standard speed (promised speed in catalogue) to the planned hour and in Machine Operation Ratio. Therefore, it is the ratio of Machine Operation Ratio in considering speed. And this rate is calculated as next.

MACHINE PERFORMANCE WITH SPEED RATE



$$\text{MPWS Rate} = \frac{\sum \frac{\text{Actual Output}}{\text{Machine Working Hour}}}{\sum \frac{\text{Logical Output}}{\text{Machine Working Hour}}} \times \frac{\text{Machine Working Hour}}{\text{Planned Working Hour}}$$

$$\text{MPWS Rate} = \sum \frac{\text{Actual Output}}{\text{Logical Output}} \times \frac{\text{Machine Working Hour}}{\text{Planned Working Hour}^*}$$

(*) Planned Working Hour: Whether the main motor is used to take information then, the hour would include the idle running.

Complicate? ...

- Actual Output/Machine Working Hour: Is understandable.
- Logical Output/Machine Working Hour: In fact, we used the number the manual or catalogue.

Therefore:

- **MPWS Rate = $\sum (\text{Actual Output/h} \div \text{Catalogue Output/h}) \times \text{Machine Working Hour} \div \sum \text{Planned Working Hour}$**
- **The ration of Machine Working (or Operative) Hours \div Planned Hour is the Machine Working Ratio.**

Then, please remember as the next formula:

$$\text{MPWS Rate} = \sum \frac{\text{Actual Output}}{\text{Logical Output}} \times \text{Machine Working Rate}$$

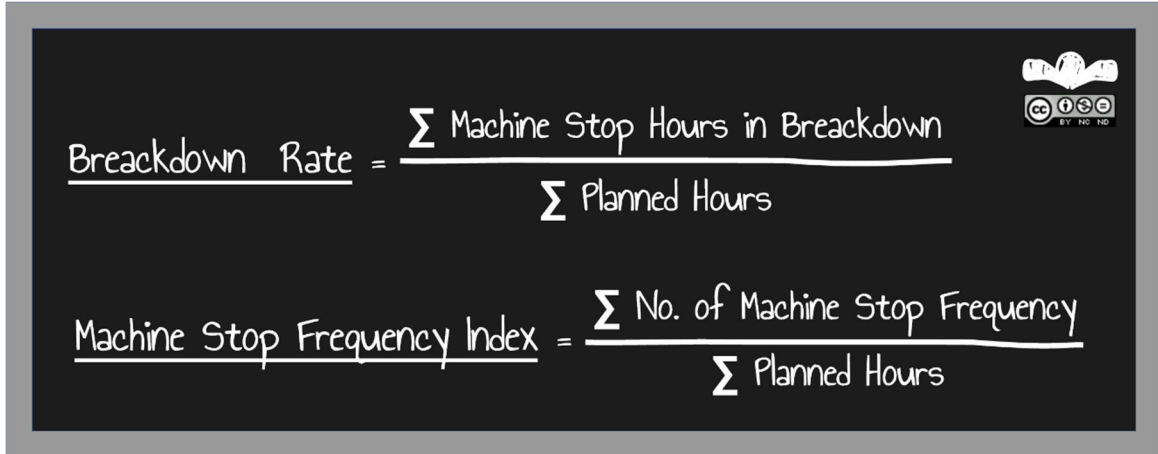


If some defect occurs in a machine run in the catalogue speed, it might be necessary to reduce the speed. Also, if there is a concern of machine parts break in the catalogue speed, its case also is required to reduce speed.

Anyway, a machine is required to keep the condition of full capacity anytime. And, whether you decide a standard speed rather than catalogue, it is also acceptable and good idea.

6) Breakdown Rate and Machine Stop Frequency Index

Above Machine Performance Ratio, Machine Operation Ratio and Machine.



$$\text{Breakdown Rate} = \frac{\sum \text{Machine Stop Hours in Breackdown}}{\sum \text{Planned Hours}}$$

$$\text{Machine Stop Frequency Index} = \frac{\sum \text{No. of Machine Stop Frequency}}{\sum \text{Planned Hours}}$$

Performance with Speed Ratio (MPwS Rate) measure the capacity against normal situation. But, both Breakdown Rate and Machine Stop Frequency Index (MSF Index), show the indexes of machine trouble.

In SUMITOMO there is a standard for categorizing Breakdown or Machine Stop Frequency in the Machine Stop Time.

- **Breakdown:** If stopping in some machine trouble more 15minutes, the machine stop is categorized as Breakdown.
- **Machine Stop Frecuency:** If stopping in some machine trouble less than 15 minutes, the machine stop is categorized as Machine Stop Frequency.

Breakdown Rate might be no required the explanation.

When occurring some machine trouble, firstly the operator's skill which is to identify the trouble is "**Choco Choco Trouble**" or serious trouble, is required. Trouble or **Choco-Tei** is a Toyota's word:

Choco: Not serious but frequent.

Tei (Teishi): Stoppage.

Then, if he judges it is serious and is required more than 15 minutes machine stop, he needs to call a maintenance engineer.

The deal of serious trouble is easy in a sense, because it is easy to identify the cause. In the other hand, **Choco-Tei** is difficult to determine the causes. Therefore, to reduce **Choco-Tei**, a tenacious activity is required.

Of course, the characteristics their causes are different. Therefore, PM activity is essential and required.

Just to be sure... In a day, it has happened that the data of Breakdown ratio showed the tremendous bad result in a machine likely 40%. It is the meaning of more than 3 hours was spent for machine repair or maintenance activity. What was happened in the machine?

In checking daily working report of the operator, it was confirmed that the repair time was just 20minutes, but waiting the maintenance engineer 3hours and 40 minutes.

Of course, the supervisor was questioned the reason why a maintenance engineer couldn't reach to the machine immediately.

The 2 countermeasures were taken:

1. One is to establish immediate support by maintenance section.
2. Another one is to install a time-counting-device. And, when maintenance engineer arrives and stars repair work, push on the device, and when finish and conform normal run again push and stop this time-counting-device.

7) Changeover Time:

This is not related to machine capacity, but relate to be the cause of machine stop.

This is also required to record the changeover time in each occasion in the daily working report by operator. It is a troublesome job, but is required to improve the changeover time reduction activity (like SMED: Single Minutes Exchange Die), cause analysis of Machine Operation Ratio.

Then, as you aware Delivery Time Observance rate and Hourly Output are a system of results.

On the other hand, Machine Performance, Machine Operation, Machine Performance with Speed, Breakdown, stop frequency and Changeover Time are the system of causes to above Delivery Time Observance and Hourly Output.

Another word to keep and improve the Delivery Time Observance and Hourly Output, it is required to analysis and improve above indexes. Other important rates in machinery related are Defect-Ratio and Scrap-Ratio, but I omit these in this column.

V. TOC

By the way, sometimes I get the requirement my comment about TOC (Theory of Constraint).

(And I described TOC in the column of Making Stream of Production-3.)

And recently I got the requirement about my point of view regarding the points of conflict TOC against TPS or Lean.

According to his letter, a TOC group recommend him to utilize it for solving the problem of every companies.

I think his question is the part of Production Control.

(In TOC there are 2 parts. One is Production Control and another is Thinking Process.)

And I responded him as next:

Hi XXX and Good morning

I haven't applied this theory in a company. Therefore, I have no experience of TOC implementation in any company.

Because this theory advocate as next: The output is restrained by the bottle neck of the production process. Then, in order to improve the situation (Throughput), it is recommended to manage the bottle neck process.

This is my belief.

I have intended to learn TOC. However, there is quite few books in Japan.

Moreover, I haven't intended to apply it because of the above concept.

I therefore do not have the qualifications to make comments.

XXX

TOC is a theory.

And when we intend to apply it, it is necessary some application system or tools.

What is the special application system or tools of TOC?

For instance, TPS has its philosophy (theory) such JIT and Jidoka also has the application tools such as Kanban.

I read books which there are in Japan and intended to learn. But I couldn't find any application tools to implement TOC.

If you can reach to the application tools, please let me know.

Of course, it is quite true that theory converting to application system is our job.

However, I haven't wanted to challenge this theory, because the theory is too usual (commonplace) in the production control.

I may have misunderstanding TOC.

Please let me know your point of view what is the basic theory of TOC.

I wrote like above. But I think that I don't misunderstand TOC.

Just making sure, the step of TOC is as next:

1. *"Finding the condition of constraint".*
2. *"Completely use the capacity of the constraint process".*
3. *"Let other processes subordinate to the constraint process".*
4. *"Improve the capacity of the constraint process".*
5. *"Appear new constraint process (in comparison) and repeat to 1)."*

From the book of TOC Revolution.

I confirmed these step in SNS Wikipedia and others. However, I have felt somewhat uneasy with No. 3 process.

After issuing Making Stream of Production-3, I read the novel "The Goal" written by Eliyahu M. Goldratt. I thought that this book is written by completely amateur about Production Control.

Production Control is constructed of 4 processes. There are Production planning, Workload Planning, Progress control and Output result control (and Delivery control).

Did Alex Logo who is the main character of this novel learn? And, if learned, what did he learn?

Yes, this stupid and poor knowledge factory manager could learn many things which are the true goal as a company, importance of throughput (managerial profit), the meaning of constraints of bottleneck process, Overproduction, standard lead time, batch size reduction & lead time reduction and cash-flow etc.

But in my point of view, these are quite natural things (commonplace).

On the other hand, the teacher Jona didn't teach the importance of Production Planning & Control, the use of KPI and Profit & Loss Calculation methods.

In the chapter of this book (Search for Herbie), there is a scene of searching new bottle neck process.

And Stacy who is the material control manager in the novel told that biggest mountain of WIP should be the next Herbie.

It is indeed childish and very low level as the knowledge of production control.

Production control is one of essential theme in factory management.

Search Herbie (bottle neck)? Ridiculous.

It must be discussed the countermeasures in the production planning.

Are there such industrial companies who don't have the certain production control system like as the company of the novel "The Goal"? ...There might be.

In a column of Making Stream of Production, I have described one episode about planning 'vs' scheduling...

When I visited a foreign company who produces vending machine, I asked to show his production planning. Then, the factory manager showed me a production scheduling. Although, I again asked to show me the production planning. But he said that this is the production planning. And, I said this is not the production planning, but just production scheduling. But he couldn't understand the difference of planning and scheduling.

—You might employ witches such Harry Potter and the witch of Cinderella who can produce anything —I said in playing joke on him and continued...

—You produce your products and, it is necessary to provide workers, machines and materials. Therefore, and if saying production planning, it is necessary to have the plan of labour and machinery capacity planning and material planning.

Additionally, for the continuity of production, the information of sales, engineering (design and production) and machine maintenance are essential.

In fact, this company hadn't certain production control system. Then I think there are such as company of Alex Logo.

In above I told that. However, I have felt somewhat uneasy with No. 3 process. (3- Let other processes subordinate to the constraint process.)

Why did I feel somewhat uneasy? ...Because of, in first place, as a factory, production control is essential. And I believe no body doubt it, but this novel doesn't teach the process of production control and its essential condition which is factory data such KPIs.

In production control, it doesn't do this "Let other processes subordinate to the constraint process."

The **Production Control** process is making next four points:

1. **Production Plan** based on the data of sales forecast, inventory, production capacity and standard lead time.
2. **Workload Planning** (labour and machinery) based on the data of labour capacity (KPIs such labour efficiency, absenteeism, turnover ratio), machinery capacity (above machinery KPIs), material supply (information of neck materials, scrap ratio, material turnover ratio), WIP & inventory data (stock level, inventory turnover ratio) and also Standard LT of each lines and machines.
3. **Progress Control** based on a system of **Genbutsu** control, a system to identify the priority of production timing and output follow-up system (initially POP system was used and at the moment IoT used system is used).
4. **Output Control** based on the system of data gathering. Now this is included in the Progress control with POP (Point of Production) or IoT used data gathering system.

Therefore, there is no such thought of "Let other processes subordinate to the constraint process."

In this novel and the chapter of "Search Herbie", there is a scene of moving inspection point from after the bottleneck machine to before. It intended to reduce the workload which included defects.

This novel factory hasn't the basic philosophy of quality assurance in and by each process.



One Sensei-Kimura pupil's view about "The Goal"

When I read this novel, I was very young. Just a little about the Japanese Way of management and thinking has reached into Spain in 1994, and also, I was in my MBA and we had taught by a member of the Goldrat Institute about TOC. At the same time, we all purchased the book 'The Goal' ... translated into Spanish by the name of 'La Meta'

At these days, it was a good lesson, mainly about Marketing about how to sell. Obviously, all of we purchased the book. Also, it was a good lesson because of the lack of other better perspectives. Fortunately, it is a good tale and, unfortunately, it suffers some lack of real knowledge and methodology. There were only a few books about JIT published by university teachers and lecturers. And all of them were merely some lists of tools and benefits, without methodology.

TOC is not a methodology, but only a one lesson about production stagnation. And the only lesson present on the book is some kind of experience about industrial production and the normal way of the managers spending their time "extinguishing fires", which, by the way, is one of the phrases of the book I remember.

The great difference between "The Goal" and other former JIT books is the merit of explaining the case of some kinds of production stagnation in a very understandable way for newcomers. The book talks about stagnation once and again in several examples in the real life and manufacturing environments but, in my point of view, it has neither reference to reliability of the process nor Planning or Control process.

Eduardo L. García

TOC in TPS 'vs' LEAN

Now, the question of my friend Mr. XXX is the conflict to TPS or Lean. And my answer is "No, there is no points of conflict particularly". This theory and teaching are very natural (commonplace) ridiculously.

In the first place, a theory might be commonplace. However, the things which are advocated by TOC are the things which I learned in new employee education of my previous company (at 1968) also learned most of the things in the book of Toyota Production System written by Taiichi Ohno.

Throughput, as an accounting term? ...Yes, I knew as the name of managerial income.

There is no conflict. But it is no necessary to take TOC especially.

Why? ...Why did I describe the story of TOC?

In Japan there is a term of despising a managerial behaviour. It is **BA-ATARI (TEKI) – KEIEI**:

BA-ATARI (TEKI): A haphazard (no plan of action).

KEIEI: Management.

A management must be never haphazard, but must be considered in data.

Of course, it is required to make high level managerial decision in uncertain data. And factory also required to manage in uncertain prospect such labour problems, machine problems and material problems and the biggest uncertain factor is sales prospect. However, it is required to make managing about statistical data which are KPIs.

BA-ATARI (TEKI) – KEIEI must be avoided in factory management. Therefore, KPIs becomes relevant for the target control and also for production planning. And, my wish to gain your good understanding is the importance of KPIs.

Just to be sure, in the last issue (TPM-1), I described as next, please understand:

“The aim of TPM is not to pursue the fake machinery performance improvement, but to pursue the production ability of the things to be necessary to produce, in the timing to be necessary to produce and in the quantity to be necessary to produce. And, for realizing this aim, machinery is maintained at the full capacity”.

Consequently, please replace the word of "The aim of TPM" by "The aim of KPIs improvement".

And, the meaning of "fake machinery performance improvement" is machine-oriented production and resulting Overproduction.

...In the next lecture I will describe the method of **Preventive Maintenance (PM)**.

Koichi Kimura CC4 – Nov-2017.

